Highlights
Environmental Management
Technology Innovation & Development

U.S. DEPARTMENT OF ENERGY
Office of Environmental Management

WHAT'S INSIDE

June 2011

Attendees interact at the Deep Vadose Zone Applied Field Research Initiative Kick-off.

Deep Vadose Zone Applied Field Research Initiative Gets Under Way

On April 29, 2011, the Deep Vadose Zone Applied Field Research Initiative (DVZ AFRI) commenced at the Hanford Reservation. The vadose zone is that part of the Earth located between the land surface and the water table. A number of dignitaries from the Department of Energy (DOE) Environmental Management (EM) and Richland Operations Office (RL) attended and spoke at the event, including Mary Neu, EM Chief Scientist, Yvette Collazo, Director of the Office of Technology Innovation and Development (OTID), Matthew McCormick, Manager of RL, and Kurt Gerdes, Director of the Office of Groundwater and Soil Remediation. Also speaking were representatives of the Environmental Protection Agency, the Washington State Department of Ecology, and the Pacific Northwest National Laboratory (PNNL).

The DVZ AFRI will provide a hub for technologies and processes to be developed collaboratively by DOE, academia, and industry. The AFRI will benefit all DOE sites with vadose zone issues, as well as other agencies and industry. By establishing this AFRI, characterization, remediation, and monitoring technologies can be developed and tested under similar conditions, providing a basis for technical and cost comparisons. The site will also be able to utilize the new Advanced Simulation Capability for Environmental Management (ASCEM) to perform scenario testing of multiple systems for treatment and remediation.

Office of River Protection, RL, and OTID have signed a Memorandum of Understanding (MOU) to manage the AFRI jointly. Dawn Wellman of PNNL will lead and manage the AFRI through this MOU. The site contractor for the vadose zone, CH2M Hill Central Plateau Remediation Contractor, will partner with the AFRI to develop technologies and processes providing a direct link for transfer of research to application.

The AFRI will be a catalyst to reduce cost and accelerate the remediation schedules by providing a forum for collaboration between researchers, cleanup contractors, and other stakeholders. Among the technologies being developed are the use of foam to apply reagents to disperse contaminants in the DVZ such as technetium, novel methods of monitoring the performance of vadose zone work, and development of a scenario-based approach to long-term monitoring of a site once contamination has been addressed.

This AFRI, along with the AFRI at Oak Ridge for mercury, the AFRI at Savannah River for attenuation based remedies, and ASCEM will form the basis of the groundwater and soil remediation program. These AFRIs and the ASCEM team will develop technologies and processes to enable the sites to meet the objectives in the EM Strategic Plan Goal 2 – Reduce the life-cycle costs and accelerate the cleanup of the Cold War environmental legacy. This collaborative effort will provide tools to enable the contractors to reduce the cost of remediation while reducing the EM footprint. ❖

Research Collaboration Wins National Recognition

A decade-long collaboration with its roots in the DOE-EM Office of Technology Innovation and Development is leading to a significant reduction in the stored high-level radioactive waste requiring treatment at the Savannah River Site (SRS) and earning kudos for its participants.

The team responsible for "Development and Implementation of High-Level Salt Waste Processing Technology at SRS" was selected to receive the Council for Chemical Research's (CCR) 2011 Collaboration Research Award. Team members include

- Savannah River National Laboratory (SRNL),
- Oak Ridge National Laboratory (ORNL),
- Argonne National Laboratory,
- Pacific Northwest National Laboratory,
- Idaho National Laboratory,
- Savannah River Remediation,
- Parsons,
- General Atomics,
- IBC Advanced Technologies, and
- The University of South Carolina.

The research and development work leading to deployment of this technology was directed by the DOE-EM Office of Technology Innovation and Development and the DOE Office of Basic Energy Sciences.

Representatives of SRNL and ORNL accepted the award on behalf of the team at the Annual CCR Meeting. CCR Executive Director C. Paul Mendez remarked that "this project involved the three pillars of U.S. chemical research—government labs, industry and academia—in a collaborative, team process that epitomizes CCR's mission. We are proud to recognize the outstanding achievement of all the partners as they progressed from fundamental research not yet tied to an application all the way to plant construction and successful operation."

Tom Peters – SRNL (left) and Bruce Moyer – ORNL (center) accept CCR Collaboration Award on behalf of the team from CCR Executive Director C. Paul Mendez.

The 10+-year research and technology deployment program began with inception of the basic scientific concepts involved and culminated with the successful startup of chemical processes for removal of radioactive cesium and strontium and selected actinides from alkaline waste solutions stored in the SRS high-level radioactive waste tanks. Two new operating processes at SRS—the Actinide Removal Process and the Modular Caustic Side Solvent Extraction Unit—were started in 2008 as interim processes for the treatment of SRS salt solutions and as proving grounds for the Salt Waste Processing Facility, now under construction. With three years of operation, the combined facilities have decontaminated more than 1.5 million gallons of radioactive waste and allowed immobilization of the radioactive cesium, strontium, and plutonium as stable glass. This leaves the large quantities of decontaminated salt solution clean enough to be handled using much less expensive low-level waste disposal methods.

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>
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CCR is a Washington-based organization whose membership represents most of the U.S. chemical research enterprise, currently comprising more than 200 companies, universities, and government laboratories with a combined R&D budget of more than $7 billion. CCR was formed in 1979 to promote cooperation in basic research and encourage high quality education in the chemical sciences and engineering. The mission of the CCR is to benefit society by advancing research in chemistry, chemical engineering, and related disciplines through leadership collaboration across discipline, institution, and sector boundaries. ❖

Improving Safety and Performance in Deactivation & Decommissioning Operations at the Experimental Breeder Reactor II

Four technology development projects funded in part by the DOE Office of Deactivation & Decommissioning (D&D) and Facilities Engineering are helping to better ensure the safety of personnel working to eliminate highly reactive sodium and tear down the Idaho National Laboratory Experimental Breeder Reactor II (EBR-II), one of the most complicated and challenging D&D projects within the DOE complex. The D&D and FE money has been added to $70 million in American Recovery and Reinvestment Act (ARRA) funds for the EBR-II Project, which is part of the Idaho Closure Project (ICP).

Office Director Andrew Szilagyi said the mission of the Office of D&D and FE is to develop, demonstrate and facilitate implementing innovative technologies and approaches that result in safe, cost-effective, and timely D&D at DOE facilities.

LED portable lighting was tested and used as a safe and efficient alternative in demolition areas.

A 30-foot long reach tool uses a plasma torch in a high radiation field to cut metal at the EBR-II.

The technology development funding has helped

1. develop a revolutionary approach for EBR-II sodium treatment;
2. develop and modify long-reach remote tapping instruments for draining piping systems in high radiation areas;
3. provide more efficient portable lighting when electricity is isolated from demolition areas; and
4. produce two DOE draft guidance documents.

As part of the technology development activities, CH2M Washington Group Idaho's (CWI) D&D team, in collaboration with the University of Idaho, developed the first process of its kind to efficiently remove "passivated" sodium residue from piping and tanks with citric acid, potentially saving the government millions of dollars and making the process much less dangerous for onsite workers.

EBR-II operated for 31 years and was capable of "breeding" its own nuclear fuel, converting non-fissionable uranium into fissionable plutonium. After EBR-II shut down in 1994, most of the sodium was drained from the primary and secondary sodium coolant loops. Moist carbon dioxide (CO_2) was used from 2002 to 2005 to passivate the remaining highly radioactive sodium, but that left an estimated 800 gallons of untreated elemental sodium beneath a crust of up to four inches of sodium bicarbonate, similar to baking soda, within the system.

Last February, the first round of treating the passivated sodium with citric acid and cleaning out piping was successfully completed – thanks in large part to the innovative citric acid process. The D&D team developed the new treatment process, built a new system, and implemented safety controls in 18 months. A provisional U.S. patent application has been filed on the unique citric acid technique, because it may be applicable in select locations globally.

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"It is estimated that this technique will save a minimum of $6 million over the original plan," which called for removing piping and equipment in small sections and treating each separately, ICP's Kirk Dooley said, noting the original plan would have extended the schedule by an estimated four years. The citric acid process will allow the EBR-II project to be completed on cost and schedule.

The funding also enabled CWI personnel, working with S.A. Technology Inc. of Loveland, Colorado, to develop a remote tapping tool that can be operated from a distance when attaching a tap-and-drain assembly to a piping system in high radiation areas. The tool improves worker safety and reduces the need for personal protection equipment by increasing distance from the radiological source and reducing dose to workers. Other technical activities have involved a safer portable lighting system and two guidance documents to ensure safe conduct of work. ❖

U.S. and UK attendees of the Plutonium Workshop at Savannah River Site. **First Row**: Beth Hackney (SRNS); Jim Marra (DOE/EM); Rebecca Weston (UK/Sellafield); Gary DeLeon (DOE/EM); Hitesh Nigam (DOE/EM); Natraj Iyer (SRNL); Kerry Dunn (SRNL). **Second Row**: Tom Monahon (SRNS); Kevin Leyland (UK/Sellafield); Chip McClard (SRNS); Steve Hensel (SRNL) Charlie Scales (UK/NNL); Paul Gilchrist (UK/NDA); Andrew Worrall (UK/NNL); Matt Hackney (SRNS); John Berg (LANL); Paul Cook (UK/Sellafield).

UK NDA/U.S. DOE Collaborate on Plutonium Management

A joint U.S. – United Kingdom (UK) workshop on plutonium materials management allowed participants to learn about and compare the plutonium program strategies in the two countries. The DOE-EM Office of Nuclear Materials Disposition sponsored the workshop, which was hosted by the Savannah River National Laboratory in South Carolina in April 2011. The workshop focused on plutonium materials packaging, storage, surveillance and disposition. Participants included staff from DOE-EM Headquarters, DOE-Savannah River, DOE-National Nuclear Security Administration, UK Nuclear Decommissioning Authority, UK National Nuclear Lab, Sellafield Sites Ltd, Los Alamos National Laboratory, Shaw-Areva MOX, and Savannah River Nuclear Solutions. During the workshop participants reviewed ongoing technical activities in plutonium stabilization, packaging, and long-term performance of storage containers, surveillance technologies (destructive and non-destructive examination), and strategies for disposition of surplus plutonium (using immobilization and converting plutonium into mixed oxide fuel). The two and a half day workshop also included tours of the Defense Waste Processing Facility and the Mixed Oxide Fuel Fabrication Facility, under construction, at the Savannah River Site.

The workshop attendees benefitted from sharing of experience and expertise. Key differences in each other's programs were also highlighted. During the workshop, potential areas for collaborative research and technology development were also identified, and a detailed path forward for collaboration will be advanced through conference calls and exchanges amongst technical experts at upcoming national and international conferences. ❖

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